

## THE CLAIMS

What is claimed is:

- 5           1.    A method of making a semiconductor structure having a surface layer of a first material, a sub-surface layer of a second, different material, and a supporting substrate, which method comprises:  
              selectively implanting atoms through the surface  
10    layer and at least a portion of the sub-surface layer to render the first and second materials receptive to removal by etching; and  
              etching at least that portion of the sub-surface layer through which atoms have been implanted.  
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2.    The method according to claim 1, which further comprises providing the second material to be one that is more susceptible to etching than the first material so that it can be removed more easily than the first  
20    material.
3.    The method according to claim 1, wherein the first material is a semiconductor material and the second material has properties sufficient to electrically  
25    insulate the first material so that the sub-surface layer is an insulating layer.
4.    The method according to claim 3, in which the first material of the surface layer is silicon and the  
30    atoms to be implanted are ions of hydrogen or ions of helium.
5.    The method according to claim 1, wherein the atoms are implanted through the entire thickness of the  
35    sub-surface layer.
6.    The method according to claim 1, wherein the selective implantation of atoms is obtained by masking a

portion of the surface layer and implanting atoms in a zone that has a shape that corresponds with the non-masked portion of the surface layer.

5           7.    The method according to claim 6, wherein the masking is applied to define an implantation zone of a predetermined shape.

10           8.    The method according to claim 7, wherein the predetermined shape of the implantation zone is concave or convex.

15           9.    The method according to claim 7, wherein the predetermined shape of the implantation zone is polygonal.

20           10.   The method according to claim 1, which further comprises forming at least one hole in the surface layer to a depth that leads to the sub-surface layer.

25           11.   The method according to claim 10, wherein the hole leads to a boundary of the implantation zone and an adjacent zone through which atoms have not been implanted so that the implanted one as well as a portion of the non-implanted zone can be removed.

          12.   The method according to claim 1, wherein the etching is performed with an acid.

30           13.   The method according to claim 1, wherein the etching is performed wet or dry.

35           14.   The method according to claim 10, wherein the second material is silicon dioxide ( $\text{SiO}_2$ ); silicon nitride ( $\text{Si}_3\text{N}_4$ ); diamond; sapphire; hafnium oxide ( $\text{HfO}_2$ ); zirconium oxide ( $\text{ZrO}_2$ ); alumina ( $\text{Al}_2\text{O}_3$ ); lanthanum oxide ( $\text{La}_2\text{O}_3$ ); or ytterbium oxide ( $\text{Y}_2\text{O}_3$ ).

15. A semiconductor structure comprising, on a supporting substrate:

- a surface layer of a first material;
- a sub-surface layer of a second material; and
- 5 a selected zone in both the surface layer and at least a portion of the sub-surface layer in which atoms have been implanted.

16. The semiconductor structure of claim 15 wherein the selected atom-implanted zone has a concave, convex, or polygonal shape in a plane parallel to that of the sub-surface layer.

17. The semiconductor structure according to claim 15, wherein the second material is more susceptible to etching than the first material.

18. The semiconductor structure according to claim 15, wherein the first material is a semiconductor material and the second material has properties sufficient to electrically insulate the first material so that the sub-surface layer is an insulating layer.

19. The semiconductor structure according to claim 18, wherein the first material of the surface layer is silicon and the implanted atoms are ions of hydrogen or ions of helium.

20. A semiconductor structure comprising, in a silicon substrate:

- a surface layer of a first material;
- a sub-surface layer of a second material; and
- a selected zone of predetermined shape in the surface layer in which atoms have been implanted and a
- 35 cavity formed in at least a portion of the sub-surface layer.

21. The semiconductor structure according to claim 20, wherein the cavity has a shape that does not extend beyond or is essentially the same as that of the selected zone.

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22. The semiconductor structure according to claim 20, in which at least a portion of the cavity extends beyond the shape of the selected zone and into a portion of the sub-surface layer which is not implanted with atoms.

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23. The semiconductor structure according to claim 20, wherein the cavity has a cylindrical, or semi-cylindrical, square or rectangular shape.

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24. The semiconductor structure according to claim 20, wherein the cavity is elliptical, partially elliptical, polygonal or partially polygonal in shape.

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25. A semiconductor structure comprising, in a silicon substrate:

a surface layer of a first material;

a sub-surface layer of a second material; and

a selected zone of predetermined shape in the

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surface layer in which atoms have been implanted and a cavity formed in at least a portion of the sub-surface layer;

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wherein the cavity includes a first zone having a first maximum dimension, and a second zone having a second maximum dimension, with the second maximum dimension being different from the first.

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26. The semiconductor structure according to claim 25, wherein the first and second zones of the cavity are situated at different mean depths in the sub-surface layer.